

SEQUENCE LISTING

5 <110> Degussa AG
 National University of Ireland, Galway
 Forschungszentrum Jülich GmbH

10 <120> Process for the Preparation of L-Amino Acids with
 Amplification of the zwf Gene.

<130> 990239BT

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20 <170> PatentIn Ver. 2.1

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 35 accgaggccg tggacaagtt cgttgcttct tggagcgaac tgcttgagtc catggaagct 420
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 45 actccccgcg atcgtgggcc cttccggc atg gtg atc ttc ggt gtc act ggc 652
 Met Val Ile Phe Gly Val Thr Gly
 1 5
 50 gac ttg gct cga aag aag ctg ctc ccc gcc att tat gat cta gca aac 700
 Asp Leu Ala Arg Lys Lys Leu Leu Pro Ala Ile Tyr Asp Leu Ala Asn
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 cgc gga ttg ctg ccc cca gga ttc tcg ttg gta ggt tac ggc cgc cgc 748
 Arg Gly Leu Leu Pro Pro Gly Phe Ser Leu Val Gly Tyr Gly Arg Arg
 25 30 35 40
 55 gaa tgg tcc aaa gaa gac ttt gaa aaa tac gta cgc gat gcc gca agt 796
 Glu Trp Ser Lys Glu Asp Phe Glu Lys Tyr Val Arg Asp Ala Ala Ser
 45 50 55

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		Glu Gly Met Glu Phe Val Arg Gly Asn Phe Asp Asp Asp Ala Ala Phe	
		75 80 85	
10		gac aac ctc gct gca aca ctc aag cgc atc gac aaa acc cgc ggc acc	940
		Asp Asn Leu Ala Ala Thr Leu Lys Arg Ile Asp Lys Thr Arg Gly Thr	
		90 95 100	
15		gcc ggc aac tgg gct tac tac ctg tcc att cca cca gat tcc ttc gca	988
		Ala Gly Asn Trp Ala Tyr Tyr Leu Ser Ile Pro Pro Asp Ser Phe Ala	
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25		gaa gca tgg cgc cgc gtg atc atc gag aag cct ttc ggc cac aac ctc	1084
		Glu Ala Trp Arg Arg Val Ile Ile Glu Lys Pro Phe Gly His Asn Leu	
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		Glu Ser Ala His Glu Leu Asn Gln Leu Val Asn Ala Val Phe Pro Glu	
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		Ser Ser Val Phe Arg Ile Asp His Tyr Leu Gly Lys Glu Thr Val Gln	
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		Asn Ile Leu Ala Leu Arg Phe Ala Asn Gln Leu Phe Glu Pro Leu Trp	
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45		aac tcc aac tac gtt gac cac gtc cag atc acc atg gct gaa gat att	1276
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		Gly Leu Gly Gly Arg Ala Gly Tyr Tyr Asp Gly Ile Gly Ala Ala Arg	
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		Asp Val Ile Gln Asn His Leu Ile Gln Leu Leu Ala Leu Val Ala Met	
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		265 270 275 280	
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		Ala Arg Gly Gln Tyr Ala Ala Gly Trp Gln Gly Ser Glu Leu Val Lys	
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 Gly Leu Arg Glu Glu Asp Gly Phe Asn Pro Glu Ser Thr Thr Glu Thr
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 Phe Ala Ala Cys Thr Leu Glu Ile Thr Ser Arg Arg Trp Ala Gly Val
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ccg ttc tac ctg cgc acc ggt aag cgt ctt ggt cgc cgt gtt act gag 1660
 Pro Phe Tyr Leu Arg Thr Gly Lys Arg Leu Gly Arg Arg Val Thr Glu
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15

att gcc gtg gtg ttt aaa gac gca cca cac cag cct ttc gac ggc gac 1708
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20

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gat gaa ggt gtg ctc atc cgc ttc ggt tcc aag gtt cca ggt tct gcc 1804
 Asp Glu Gly Val Leu Ile Arg Phe Gly Ser Lys Val Pro Gly Ser Ala
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35

act gaa gaa tca cct gaa gca tac gag cgc ctt atc ttg gat gcg ctg 1900
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atg ctt tcc cgc aac ggt cac acc tgg cgc agg cca taatttaggg 2090
 Met Leu Ser Arg Asn Gly His Thr Trp Arg Arg Pro
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 35 40 45
 Lys Tyr Val Arg Asp Ala Ala Ser Ala Gly Ala Arg Thr Glu Phe Arg
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 15 Glu Asn Val Trp Glu Arg Leu Ala Glu Gly Met Glu Phe Val Arg Gly
 65 70 75 80
 20 Asn Phe Asp Asp Asp Ala Ala Phe Asp Asn Leu Ala Ala Thr Leu Lys
 85 90 95
 Arg Ile Asp Lys Thr Arg Gly Thr Ala Gly Asn Trp Ala Tyr Tyr Leu
 100 105 110
 25 Ser Ile Pro Pro Asp Ser Phe Ala Ala Val Cys His Gln Leu Glu Arg
 115 120 125
 Ser Gly Met Ala Glu Ser Thr Glu Glu Ala Trp Arg Arg Val Ile Ile
 130 135 140
 30 Glu Lys Pro Phe Gly His Asn Leu Glu Ser Ala His Glu Leu Asn Gln
 145 150 155 160
 35 Leu Val Asn Ala Val Phe Pro Glu Ser Ser Val Phe Arg Ile Asp His
 165 170 175
 Tyr Leu Gly Lys Glu Thr Val Gln Asn Ile Leu Ala Leu Arg Phe Ala
 180 185 190
 40 Asn Gln Leu Phe Glu Pro Leu Trp Asn Ser Asn Tyr Val Asp His Val
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 Gln Ile Thr Met Ala Glu Asp Ile Gly Leu Gly Gly Arg Ala Gly Tyr
 210 215 220
 45 Tyr Asp Gly Ile Gly Ala Ala Arg Asp Val Ile Gln Asn His Leu Ile
 225 230 235 240
 50 Gln Leu Leu Ala Leu Val Ala Met Glu Glu Pro Ile Ser Phe Val Pro
 245 250 255
 Ala Gln Leu Gln Ala Glu Lys Ile Lys Val Leu Ser Ala Thr Lys Pro
 260 265 270
 55 Cys Tyr Pro Leu Asp Lys Thr Ser Ala Arg Gly Gln Tyr Ala Ala Gly
 275 280 285
 Trp Gln Gly Ser Glu Leu Val Lys Gly Leu Arg Glu Glu Asp Gly Phe
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Asn Pro Glu Ser Thr Thr Glu Thr Phe Ala Ala Cys Thr Leu Glu Ile
305 310 315 320

5 Thr Ser Arg Arg Trp Ala Gly Val Pro Phe Tyr Leu Arg Thr Gly Lys
325 330 335

Arg Leu Gly Arg Arg Val Thr Glu Ile Ala Val Val Phe Lys Asp Ala
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10 Pro His Gln Pro Phe Asp Gly Asp Met Thr Val Ser Leu Gly Gln Asn
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15 Ala Ile Val Ile Arg Val Gln Pro Asp Glu Gly Val Leu Ile Arg Phe
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Gly Ser Lys Val Pro Gly Ser Ala Met Glu Val Arg Asp Val Asn Met
385 390 395 400

20 Asp Phe Ser Tyr Ser Glu Ser Phe Thr Glu Glu Ser Pro Glu Ala Tyr
405 410 415

Glu Arg Leu Ile Leu Asp Ala Leu Leu Asp Glu Ser Ser Leu Phe Pro
420 425 430

25 Thr Asn Glu Glu Val Glu Leu Ser Trp Lys Ile Leu Asp Pro Ile Leu
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5 accgaggccg tggacaagtt cggttgcttct tggagcgaac tgcttgagtc catggaagct 420

cgctgaagt agaatcagca cgctgcatca gtaacggcga catgaaatcg aattagttcg 480

atcttatgtg gccgttacac atctttcatt aaagaaagga tcgtgacgct taccatc 537

10 gtg agc aca aac acg acc ccc tcc agc tgg aca aac cca ctg cgc gac 585
Met Ser Thr Asn Thr Thr Pro Ser Ser Trp Thr Asn Pro Leu Arg Asp
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15 ccg cag gat aaa cga ctc ccc cgc atc gct ggc cct tcc ggc atg gtg 633
Pro Gln Asp Lys Arg Leu Pro Arg Ile Ala Gly Pro Ser Gly Met Val
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20 atc ttc ggt gtc act ggc gac ttg gct cga aag aag ctg ctc ccc gcc 681
Ile Phe Gly Val Thr Gly Asp Leu Ala Arg Lys Lys Leu Leu Pro Ala
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25 att tat gat cta gca aac cgc gga ttg ctg ccc cca gga ttc tcg ttg 729
Ile Tyr Asp Leu Ala Asn Arg Gly Leu Leu Pro Pro Gly Phe Ser Leu
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30 gta ggt tac ggc cgc cgc gaa tgg tcc aaa gaa gac ttt gaa aaa tac 777
Val Gly Tyr Gly Arg Arg Glu Trp Ser Lys Glu Asp Phe Glu Lys Tyr
65 70 75 80

35 gta cgc gat gcc gca agt gct ggt gct cgt acg gaa ttc cgt gaa aat 825
Val Arg Asp Ala Ala Ser Ala Gly Ala Arg Thr Glu Phe Arg Glu Asn
85 90 95

40 gtt tgg gag cgc ctc gcc gag ggt atg gaa ttt gtt cgc ggc aac ttt 873
Val Trp Glu Arg Leu Ala Glu Gly Met Glu Phe Val Arg Gly Asn Phe
100 105 110

gat gat gat gca gct ttc gac aac ctc gct gca aca ctc aag cgc atc 921
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115 120 125

45 gac aaa acc cgc ggc acc gcc ggc aac tgg gct tac tac ctg tcc att 969
Asp Lys Thr Arg Gly Thr Ala Gly Asn Trp Ala Tyr Tyr Leu Ser Ile
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cca cca gat tcc ttc gca gcg gtc tgc cac cag ctg gag cgt tcc ggc 1017
Pro Pro Asp Ser Phe Ala Ala Val Cys His Gln Leu Glu Arg Ser Gly
145 150 155 160

50 atg gct gaa tcc acc gaa gaa gca tgg cgc cgc gtg atc atc gag aag 1065
Met Ala Glu Ser Thr Glu Glu Ala Trp Arg Arg Val Ile Ile Glu Lys
165 170 175

55 cct ttc ggc cac aac ctc gaa tcc gca cac gag ctc aac cag ctg gtc 1113
Pro Phe Gly His Asn Leu Glu Ser Ala Ala His Glu Leu Asn Gln Leu Val
180 185 190

	aac gca gtc ttc cca gaa tct tct gtg ttc cgc atc gac cac tat ttg	1161
	Asn Ala Val Phe Pro Glu Ser Ser Val Phe Arg Ile Asp His Tyr Leu	
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	Leu Phe Glu Pro Leu Trp Asn Ser Asn Tyr Val Asp His Val Gln Ile	
	225 230 235 240	
15	acc atg gct gaa gat att ggc ttg ggt gga cgt gct ggt tac tac gac	1305
	Thr Met Ala Glu Asp Ile Gly Leu Gly Gly Arg Ala Gly Tyr Tyr Asp	
	245 250 255	
20	ggc atc ggc gca gcc cgc gac gtc atc cag aac cac ctg atc cag ctc	1353
	Gly Ile Gly Ala Ala Arg Asp Val Ile Gln Asn His Leu Ile Gln Leu	
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25	ttg gct ctg gtt gcc atg gaa gaa cca att tct ttc gtg cca gcg cag	1401
	Leu Ala Leu Val Ala Met Glu Glu Pro Ile Ser Phe Val Pro Ala Gln	
	275 280 285	
30	ctg cag gca gaa aag atc aag gtg ctc tct gcg aca aag ccg tgc tac	1449
	Leu Gln Ala Glu Lys Ile Lys Val Leu Ser Ala Thr Lys Pro Cys Tyr	
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35	cca ttg gat aaa acc tcc gct cgt ggt cag tac gct gcc ggt tgg cag	1497
	Pro Leu Asp Lys Thr Ser Ala Arg Gly Gln Tyr Ala Ala Gly Trp Gln	
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40	ggc tct gag tta gtc aag gga ctt cgc gaa gaa gat ggc ttc aac cct	1545
	Gly Ser Glu Leu Val Lys Gly Leu Arg Glu Glu Asp Gly Phe Asn Pro	
	325 330 335	
45	gag tcc acc act gag act ttt gcg gct tgt acc tta gag atc acg tct	1593
	Glu Ser Thr Thr Glu Thr Phe Ala Ala Cys Thr Leu Glu Ile Thr Ser	
	340 345 350	
50	cgt cgc tgg gct ggt gtg ccg ttc tac ctg cgc acc ggt aag cgt ctt	1641
	Arg Arg Trp Ala Gly Val Pro Phe Tyr Leu Arg Thr Gly Lys Arg Leu	
	355 360 365	
55	ggc tct gag tta gtc aag gga ctt cgc gaa gaa gat ggc ttc aac cct	1689
	Gly Arg Arg Val Thr Glu Ile Ala Val Val Phe Lys Asp Ala Pro His	
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	Lys Val Pro Gly Ser Ala Met Glu Val Arg Asp Val Asn Met Asp Phe	
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 Glu Glu Val Glu Leu Ser Trp Lys Ile Leu Asp Pro Ile Leu Glu Ala
 465 470 475 480
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 20 cca aag agc gct gat gaa atg ctt tcc cgc aac ggt cac acc tgg cgc 2073
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 Arg Pro
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 35 40 45
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 210 215 220
 Leu Phe Glu Pro Leu Trp Asn Ser Asn Tyr Val Asp His Val Gln Ile
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 245 250 255
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 260 265 270
 30 Leu Ala Leu Val Ala Met Glu Glu Pro Ile Ser Phe Val Pro Ala Gln
 275 280 285
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 290 295 300
 35 Pro Leu Asp Lys Thr Ser Ala Arg Gly Gln Tyr Ala Ala Gly Trp Gln
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 40 Gly Ser Glu Leu Val Lys Gly Leu Arg Glu Glu Asp Gly Phe Asn Pro
 325 330 335
 Glu Ser Thr Thr Glu Thr Phe Ala Ala Cys Thr Leu Glu Ile Thr Ser
 340 345 350
 45 Arg Arg Trp Ala Gly Val Pro Phe Tyr Leu Arg Thr Gly Lys Arg Leu
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 Gly Arg Arg Val Thr Glu Ile Ala Val Val Phe Lys Asp Ala Pro His
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 50 Gln Pro Phe Asp Gly Asp Met Thr Val Ser Leu Gly Gln Asn Ala Ile
 385 390 395 400
 55 Val Ile Arg Val Gln Pro Asp Glu Gly Val Leu Ile Arg Phe Gly Ser
 405 410 415
 Lys Val Pro Gly Ser Ala Met Glu Val Arg Asp Val Asn Met Asp Phe
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Ser Tyr Ser Glu Ser Phe Thr Glu Glu Ser Pro Glu Ala Tyr Glu Arg
 435 440 445

5 Leu Ile Leu Asp Ala Leu Leu Asp Glu Ser Ser Leu Phe Pro Thr Asn
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Arg Pro

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 zwf-forward

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 forward Primer

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